

Measure 4: Pedestrian Activity at Bus Zones

Monitoring Objectives

The purpose of monitoring pedestrian activity at bus zones was to quantitatively assess pedestrian congestion at critical bus stops within the Seattle downtown core. In particular, the study focused on the impacts that transit tunnel closure had on pedestrian congestion at or near bus stops on surface streets. This portion of the study aims to answer the following key questions:

- How crowded are bus stops after tunnel re-opening?
- Have the “hot-spots” that were identified in the pedestrian congestion study after tunnel closure been mitigated with the tunnel re-opening, or do problems remain?
- How does the amount of pedestrian congestion at key bus stops compare across baseline, tunnel closure, and tunnel re-opened conditions?

Methodology

The studies for pedestrian activity at bus zones have focused on two elements of pedestrian congestion: pedestrian flow and pedestrian crowding.

Pedestrian flow is applicable to the movement through the bus zone and is based on the number of pedestrians passing per minute passing through a walkway of limited width. The *2000 Highway Capacity Manual* specifies criteria for LOS designations of A through F for walkways. In addition to these criteria, pedestrian level of service was further evaluated using procedures outlined in *Urban Spaces for Pedestrians* by Pushkarev and Zupan (1975).

Pedestrian crowding is applicable to waiting and queuing areas, and is based on the average space available per person. The Transit Cooperative Research Program (TCRP) Transit Capacity and Quality of Service Manual specify criteria for Level of Service (LOS) designations ranging from A to F for queuing and waiting areas (Part 7, Chapter 3). In addition to these national guidelines, Metro applied its own criteria to the amount of space available per person in bus stop waiting areas.

Volume 1 of the *Performance Report on Surface Streets in the Seattle Central Business District* includes a more detailed description of the pedestrian survey methodology and criteria used for pedestrian level of service assessment. To measure the pre-tunnel closure conditions, an initial pedestrian congestion study was conducted at 19 selected bus zones in spring 2005¹. These results were reported in Volume 1. In the first post-tunnel closure study, conducted in fall 2005, 25 bus zones were studied, including newly installed bus stops². These results were reported in Volume 2. Based on these results, five “hot spot” locations were selected for further study³, and the results were reported in Volume 3. For this seventh and final volume, the “hot spot” locations were revisited to see if tunnel re-opening had changed the pedestrian condition. In addition to the hot spot locations, three additional bus zones on Third Avenue were selected for analysis. The data for these eight zones constituted the tunnel-re-opening pedestrian study. The results from this study are compared with applicable data from the three other pedestrian congestion studies that were previously conducted at these sites. Figure 13 shows the 25 bus stops that were surveyed during one or more of the studies. All of the data collection for the tunnel re-opening study was conducted between October 30, 2007 and November 15, 2005, on Tuesdays, Wednesdays, and Thursdays only.

¹ Pedestrian Congestion Study, Existing Conditions Analysis, 7-18-2005

² Pedestrian Congestion Study, Fall 2005 Conditions Report, 11-23-2005

³ Pedestrian Congestion Study Addendum, Spring 2006 “Hot Spot” Analysis, 3-8-2006

Figure 13. Bus Stops Surveyed for Pedestrian Congestion Counts



Figure 14A summarizes the cumulative results of the pedestrian congestion studies at the eight zones selected for monitoring after tunnel re-opening, as they relate to pedestrians walking through the bus zones. Figure 14B summarizes the cumulative results of these same bus zones as they relate to pedestrians waiting at the bus stops.

Figure 14A. Walking Pedestrian Rank and Level of Service by Bus Stop.

Bus Stop Location		Tunnel OPEN		Tunnel CLOSED				Tunnel OPEN	
		Spring 2005		Fall 2005		Spring 2006		Fall 2007	
Zone #	On-street/Cross Street	HCM LOS	Pushkarev & Zupan Rank	HCM LOS	Pushkarev & Zupan Rank	HCM LOS	Pushkarev & Zupan Rank	HCM LOS	Pushkarev & Zupan Rank
300	SB 2 nd Ave./Pike St.	A	Impeded	A	Impeded	A	Unimpeded	B	Impeded
315	SB 2 nd Ave./University St.	A	Impeded	A	Impeded	A	Impeded	A	Impeded
430	SB 3 rd Ave./Pine St.	A	Impeded	A	Impeded			A	Impeded
431	SB 3 rd Ave./Pike St.			A	Impeded			B	Impeded
578	NB 3 rd Ave./Pike St.	A	Impeded	A	Impeded			A	Impeded
590	NB 3 rd Ave./Pine St.	A	Unimpeded	A	Impeded	A	Impeded	A	Impeded
690	NB 4 th Ave./Union St.	A	Impeded	C	Constrained	A	Impeded	A	Impeded
860	NB 5 th Ave./James St.	A	Impeded	A	Impeded	A	Impeded	A	Impeded

(Shaded cells indicate that the bus stop was not counted during that particular study)

All of the selected bus stops are at acceptable levels of service during the evening peak 15-minutes. Two of the locations have shown some degradation in pedestrian walking level of service since the initial tunnel closure study.

Figure 14B. Standing Pedestrian Level of Service for Full Bus Stop Area and Critical Loading Zone

Bus Stop Location		Tunnel OPEN		Tunnel CLOSED				Tunnel OPEN	
		Spring 2005		Fall 2005		Spring 2006		Fall 2007	
Zone #	On-street/Cross Street	HCM LOS	King County Rank	HCM LOS	King County Rank	HCM LOS	King County Rank	HCM LOS	King County Rank
300	SB 2 nd Ave./Pike St.	A	Desirable	A	Desirable	A	Desirable	A	Desirable
	Critical Zone	A	Constrained	B	Constrained	A	Constrained	A	Constrained
315	SB 2 nd Ave./University St.	A	Desirable	A	Desirable	A	Desirable	A	Desirable
	Critical Zone	A	Constrained	B	Constrained	A	Desirable	B	Constrained
430	SB 3 rd Ave./Pine St.	A	Desirable	A	Desirable			A	Desirable
	Critical Zone	A	Desirable	A	Desirable			A	Constrained
431	SB 3 rd Ave./Pike St.			A	Desirable			A	Constrained
	Critical Zone			A	Desirable			B	Constrained
578	NB 3 rd Ave./Pike St.	A	Desirable	A	Desirable			A	Constrained
	Critical Zone	A	Desirable	A	Constrained			B	Constrained
590	NB 3 rd Ave./Pine St.	A	Desirable	A	Constrained	A	Desirable	A	Desirable
	Critical Zone	A	Desirable	A	Constrained	A	Constrained	A	Constrained
690	NB 4 th Ave./Union St.	A	Desirable	A	Desirable	A	Desirable	A	Desirable
	Critical Zone	A	Desirable	A	Desirable	A	Desirable	A	Desirable
860	NB 5 th Ave./James St.	A	Desirable	B	Constrained	A	Desirable	A	Desirable
	Critical Zone	B	Constrained	C	Uncomfortable	A	Constrained	C	Constrained

During the PM peak period, all of the bus zones included in this study still operate at a high level of service, LOS A, as defined by the nationally accepted guidelines in the Highway Capacity Manual, and considering the entire bus zone waiting area. Using a more stringent methodology developed by King

County, the critical loading areas for seven of the eight study bus zones experience constrained conditions.

Summary Observations

Conditions for walking pedestrians have remained relatively consistent across all survey periods for the eight bus zones included in the fall 2007 survey. Overall, the level of service for walking pedestrians appears to be relatively unaffected by either the closure or the re-opening of the Third Avenue transit tunnel. Level of service is more affected by localized changes related to the available sidewalk space.

For waiting pedestrians, most of the eight bus zones included in the fall 2007 survey are operating under “Desirable” conditions at LOS A. However, three of the locations have degraded somewhat over conditions that were observed before and during tunnel closure, as described below:

- Zone 860 (NB 5th Ave & James St): This bus zone continues to be the most crowded of the study locations during the PM peak. The number standing pedestrians in the critical loading zone has increased over the previous study; however, the number is not as high as conditions just after tunnel closure (Fall 2005). This zone also has the narrowest sidewalk of all of the study zones, which contributes to its high level of crowding.
- Zones 431 and 578 (NB and SB 3rd Ave & Pike St): These bus zones operated at LOS A and “Constrained” conditions during the fall 2007 study, which is somewhat degraded from the conditions during tunnel closure. This is likely due to the addition of several high-ridership routes to Third Avenue during the tunnel re-opening. In addition, the overall increases in Metro ridership between 2005 and 2007 have likely increased the usage of these bus stops.

Even with the bus zones operating at a lower level of service or rank than previous surveys, all of the bus zones operated at or above LOS C and at or above “Constrained” conditions in the fall 2007 survey, which are acceptable levels of service for waiting pedestrians.